Transcending the Binary of Renewables and Fossil Fuels

Transitional Technologies to Mitigate Climate Change

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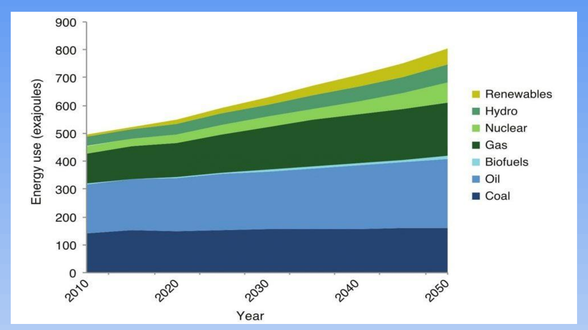
ABSTRACT

The rising concentration of greenhouse gasses in the Earth's atmosphere has affected every geophysical system on which human beings depend. The warming planet affects all human systems including food supply, health, security, property, business, jobs, markets, and economies. The most severe consequences to climate change are felt in low and low-middle income regions, countries/economies where communities are heavily dependent on fossil fuels. In these regions, fossil fuels are cheap and accessible and for provide only the most basic energy needs. Currently, one billion people worldwide have no access to a reliable energy source.

The demands for the immediate cessation of fossil fuels are almost exclusively from economically and energy privileged industrialized nations. Justice in climate change mitigation recognizes that fossil fuels and renewable energy sources will co-exist, possibly for the next century.

Successful mitigation will be a conglomeration of technologies executing multiple scenarios requiring broad coalitions with varying adaptabilities transcending the binary of fossil fuels and renewables. A suite of transitional technologies exists that utilizes fossil fuels to meet energy needs while insuring near zero GHG emissions. Carbon Capture. Our conclusions, supported findings of the UN Intergovernmental Panel on Climate Change, are that carbon capture technologies are a critical element to achieving climate justice together with climate change mitigation.



Population growth projections in Africa and Asia will drive the growing energy demand . It is estimated that the regions currently experiencing energy poverty will generate nearly 90% of the growing incremental global energy demand. (MIT Energy Initiative)

ENERGY POVERTY

Energy poverty, affecting 1 billion people worldwide, is the inability to access reliable energy sources. The implications are far-reaching. Given the pandemic, one facet of an insufficient energy supply worthy of critical analysis is health care. There is a lack of modern medical equipment to diagnose and treat, no refrigeration for vaccines or to maintain a blood supply, etc., no diagnostic tests e.g., x-rays. There is virtually no path to health, wellbeing and prosperity – much less a livable standard of care – without access to energy generation capable of supporting industrialization, infrastructure, health care, education, and jobs.

The dense urban settlements of Tondo and San Andres in Manila are just two of the regions marginalized in global energy planning and climate mitigation strategies.

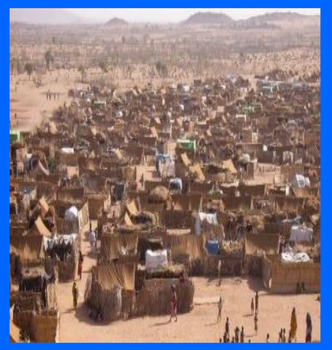
ENERGY TRANSITION

The world has never been faced with a technological challenge as critical as the one before us - to reduce greenhouse gasses and mitigate climate change with greatest consideration to climate-marginalized communities.

The aggressive decarbonization goals targeting 2050 require a planned transition involving aspects of economics, politics, society, and ethics. To meet these goals, fossil fuels and renewables will co-exist, particularly in the Energy sector..

Renewable energy will be the sole source of energy for the planet, someday. Today, costs are decreasing and operational efficiencies for renewable technologies are improving. However, re-engineering the grid, providing large-scale consistent generation, insuring low reactive power to re-charge from blackouts – essentially delivery and storage that include marginalized communities – are the practical issues that underscore continued use of fossil fuels.

The use of fossil fuel use to produce electrical power is commonly viewed as being at odds with global and domestic environmental goals. There is no fundamental reason why energy production should contribute to climate change.



Climate refugees or environmental migrants are a growing percent of the broader global refugee crisis. Driven by extreme weather events and regional resource scarcity, this situation is adding complexities to national and global governance and creates conditions for unchecked human rights abuses

CARBON CAPTURE

Carbon capture are technologies that remove CO_2 (and other GHG) from both emissions processes and directly from the air. Simply, CO_2 is separated from other elements/compounds and "captured". Following "capture", the CO_2 is then compressed, contained and transported for either storage or further commercial utilization.

The primary carbon capture technologies are:

Direct Air Capture: removing CO_2 from ambient air using large fans that act as a giant vacuum. Through a physiochemical process in a series of filters, CO_2 is adsorbed by chemicals producing a stream of CO_2 which is then contained. Note: Unless the fans are powered by renewable energy sources, this capture process is net CO_2 additive through the value chain.

The next two technologies are applied to the combustion process powering plants and industrial facilities that use fossil fuels. When fossil fuels are burned for energy to run plants the substances created are water, CO_2 particulate matter, heavy metals, and acidic gasses. These substances are the emissions vented into the atmosphere as flue gasses.

Post-Combustion: removes CO_2 from the flue gasses after the fossil fuels are burned. CO_2 is scrubbed out by either sorbents or membranes. Most carbon capture technologies operating today are post-combustion.

Oxy-Fuel: separates CO_2 from other substances *during* the combustion process, while the fossil fuel is burning using near pure oxygen instead of ambient air to fuel the flame. Near pure oxygen eliminates nitrogen hence removing NOx from the flue gas. SOx and PM are also drastically reduced through oxy-fuel carbon capture.

SUMMARY

In 2019, Pope Francis affirmed four "universal apostolic preferences" guiding the life and work of the Jesuits and their communities. The second preference is "walking with the poor" and includes those cast out of their home and communities due to the injustice of climate change. Those experiencing energy poverty live in regions that have been further marginalized in most climate mitigation strategies. The narratives accompanying the myriad of solutions cast fossil fuels as the villain – not without merit. Fossil fueled power generation has contributed up to 70% of GHG. However, a "renewables only" solution unintentionally condemns millions currently experiencing energy poverty and will serve to further complicate the climate refugee crisis. Transitional technologies, like carbon capture, allow for the continued use of fossil fuel with substantial decreases in GHG allowing for renewable technologies to develop in scope and scale to support the growing energy demand.

Jupiter Oxygen Corporation is a privately held energy technology company that has patented an oxy-fuel carbon capture technology. Capturing 97% of CO_2 emissions and substantially reducing NOx, SOx and PM, this technology is at the construction phase of its project at a coal-fired power plant in Wyoming.

Post- and Oxy-Fuel Combustion carbon capture technologies are "point source" technologies, removing CO_2 and other GHG from the emissions source e.g.. power and manufacturing facilities.

Direct Air Carbon Capture pulls ambient air through fans and into a process that separates then "captures" CO_2 which is then utilized or sequestered.

REFERENCES

Bloomberg NEF, New Energy Outlook, October 2020
World Energy Outlook, 2020
Habitat for Humanity
UN Environment Program, International Resource Panel
UN Intergovernmental Panel on Climate Change
World Bank
Duke Energy
NASA
International Monetary Fund
Massachusetts Institute of Technology Energy Initiative
Dow Jones / Market Watch
Carbon Engineering
World Economic Forum
Boston Globe